CHAPTER 33

ROADWAY DRAINAGE

33.1 General

The purpose of this section is to provide design requirements for the storm drainage system improvements within the street/highway ROW.

33.2 Rainfall Design Frequency

- The design frequency for urban streets is 15 years.
- The design frequency for the interstate system is 25 years.
- The design frequency for underpasses and depressed highways is 50 years.

33.3 Runoff

The design discharge should be calculated based on the Rational Method. This method is to be utilized for the sizing of storm inlets and piping for determining runoff magnitude. The Rational Method Runoff calculation is as follows:

Q = CiA
Q = Peak Runoff (cfs)
C = Coefficient of Runoff
0.9 for pavement
0.3 for grass
i = Rainfall Intensity (iph)
A = Drainage Area

Contributing drainage area shall be the impervious areas of the roadway and immediate adjacent sidewalk. If the sidewalk is separated from the roadway by a continuous grassed tree space, it shall not be included. Long slopes shall be included if they are 2:1 or steeper (20 ft. long or more) with a C = 0.7. Refer to Table 33-A for the rainfall intensity for the Washington DC area (in. per hour [iph]):

Table 33-A:
Rainfall Intensity

Time of Concentration	Frequency			
(Duration in Minutes)	10 years	15 years	25 years	50 years
5*	7.44 (iph)	7.56 (iph)	8.28	9.00
10**	5.94	6.76	6.90	7.62

*Roadway calculations
** Open field calculations

NOTE: Drainage area, A, in acres measured on highway plans, survey plans and U.S.G.S. maps.

33.4 Design Factors for Gutter Capacity and Curb Inlet Spacing

- Design Frequency – 15 years
- Maximum allowable spread – 6 ft. from curb
- Mannings value of "n" – 0.15
- Maximum allowable carryover – 10 percent of gutter flow
- Recommended grades for drainage flow are:
  - Longitudinal – 0.5 percent (minimum)
  - Cross Slope (curb lane) – ¼ in. per ft. (minimum)
- Maximum spacing of inlets on city streets shall be the length of the block. No water shall be permitted to flow through the crosswalks or across the intersection.

33.5 Storm Water Inlets

There are several types of inlets approved for use by WASA. Inlets are also classified as being on a "continuous grade" or in a sump. The term "continuous grade" refers to an inlet so located that the grade of the street has a continuous slope past the inlet and, therefore ponding does not occur at the inlet. The sump condition exists whenever water ponds because the inlet is located at a low point. A sump condition can occur at a change in grade of the street from negative to positive, or at an intersection due to the crown slope of a cross street. Where grates are used, they should be bicycle-friendly; bars should not be parallel to the roadway.

33.5.1 City Streets

33.5.1.1 Standard Curb Opening Inlets

Use standard inlets as required by WASA. If a basin larger than the Triple Standard basin is required, construct an auxiliary basin and manhole approximately 50 ft. upstream from the proposed basin. Maintain smooth and level surface in bike lane.

33.5.1.2 Highway with Full Control of Access

Gutter Opening Inlet with Safety Grate (paved shoulders with barrier curb).

33.5.1.3 Depressed and Elevated Expressways

Combination Curb and Inlet with P-Grate or special design (limited lateral clearance).

33.5.1.4 Field Inlet

Standard Inlet with Safety Grate.

33.6 General Requirements for Inlets

- All basins to be located a minimum of 5 ft. from the P.C. of corner radii except to drain sags where one basin may be placed on the P.C.
- Low point in sag - With few exceptions, one inlet at the low point and one inlet at each side 3½ in. above the low point.
- A trap or special catchment chamber shall be provided for all inlets tying directly into a storm sewer.
- A waterseal connection shall be provided for all inlets. WASA must approve the connection.
- All inlets shall connect directly into a manhole.

33.7 Connect Pipes

- Basin to manhole connect pipes shall be 15 in. diameter minimum. Check for conflicts with existing utilities.
- Length – 50 ft. maximum.
- Cover – 3 ft. minimum from top of pipe to finished grade.
- No more than three connect Pipes shall tie into any one manhole.

33.8 Storm Sewer Pipe

- Design Frequency:
  - 15-year storm with pipe flowing full.
  - 50-year storm for pipes draining low point in sag.
- Size – 18 in. diameter minimum.
- Velocity – 3 ft. per second minimum.
- Cover – A minimum depth of 5 ft. shall be placed from the top of pipe to the finished grade; 5½ ft. is desirable.
- Sewer lines must be on a straight alignment and uniform slope between manholes.

33.9 Sewer Manholes

Manholes shall be placed over sewer lines at the following locations:

- All points of change of slope or alignment.
- Upper end of sewer lines.
- Spacing – 400 ft. maximum.
- Appropriate locations for inlet connect pipes.

33.10 Temporary Erosion Control

Erosion control shall be in accordance with the **DOH** current **Standards and Specifications for Soil Erosion and Sediment Control**.

33.11 Sidewalk Chases

Storm water from concentrated points of discharge shall not be allowed to flow over sidewalks, but shall drain to the storm manholes or other approved methods of the WASA.

A sidewalk culvert shall not be located within a curb ramp, curb cut, or driveway.

33.12 Adjust and Reset Sewer Structures

Quite often various sewer and water items such as manholes, drop inlets and water valve casings need to be adjusted or reset to meet the new proposed grades and elevations. When an existing roadway is to be reconstructed, the sewer manhole can be adjusted by the addition or removal of up to three (3) courses of sewer brick (approximately 12 inches). To raise the elevation of water valve casings, two (2) precast PCC rings may be used.

If the roadway is to be salvaged, the sewer and water structures shall be reset as described in the specifications.

On resurfacing and overlay projects, cast iron adapter rings may be used to raise the manhole to grade. Only one (1) ring (1½ inches to 3½ inches in depth) may be used for each structure and shall be secured as directed.

33.13 Storm Water Design and Construction Responsibility

33.13.1 Assumptions

- All Storm Sewer Inlets, Storm Sewer Manholes, Catch Basins, Connecting Pipes and Trunk Lines are owned and maintained by the Water and Sewer Authority.
- All sidewalks, curbs, gutters, roadway and alley surfaces, bridges and bridge scuppers, catch basins on elevated highways are owned and maintained by the Department of Transportation (sanitation in public space is the primary responsibility of the Department of Public Works).

Function	Agency Responsibility	Comments
Maintain inventory of catch basins and storm water sewers.	WASA	Until June 2005, DDOT performs some catch basin inventory services on NHS roadways. D DOT
Inspects catch basins and storm sewers.	WASA	Until June 2005, DDOT inspects some catch basins on NHS roadways.
Develops maintenance schedule for catch basins and storm sewers.	WASA	Until June 2005, DDOT performs some maintenance on NHS roadways.
Develops capital program for repair and replacement of catch basins and storm sewers.	WASA	Until June 2005, DDOT repairs/replaces catch basins on NHS roadways, bridges and elevated highways
Cleans catch basins and storm sewers.	WASA	Until June 2005, DDOT performs cleaning on NHS roadways, bridges and elevated highways
Performs routine maintenance for catch basins and storm sewers.	WASA	Until June 2005, DDOT performs some maintenance on NHS roadways
Repair broken/damaged catch basins and storm sewers.	WASA	Until June 2005, DDOT repairs broken catch basins while repairing NHS roads.
Replace broken/damaged catch basins and storm sewers.	WASA	Until June 2005, DDOT replaces broken catch basins while repairing NHS roads.
Construct new catch basins and storm sewers.	WASA	DDOT constructs new catch basins as part of NHS roadway construction.

Program Area: Public Rights of Way, Storm Sewers and Catch Basins (cont.)

Conducts engineering studies in response to drainage complaints.*	WASA	DDOT will address drainage as part of roadway construction activities.
Inspects sidewalks, curbs, gutters, alleys and roadways.	DDOT	DDOT S.M. crews inspect areas while making repairs to citizen calls.
Develops maintenance schedule for sidewalks, curbs, gutters, bridge scuppers, alleys and roadways.	DDOT	DDOT S.M. prepares schedule for right-of-way maintenance.

Develops capital program for repair and replacement of sidewalks, curbs, gutters, bridge scuppers, alleys and roadways.	DDOT	DDOT S.M. prepares capital budget for right-of-way maintenance.
Conducts engineering studies to reduce drainage during reconstruction of roadways.	DDOT	
Designs and builds storm water management facilities on bridges and elevated highways.	DDOT	
Maintains storm water management facilities on bridges and elevated highways.	DDOT	
Maintains storm water management facilities on National Highway System Routes.	DDOT	Until June 2005, DDOT has total responsibility for drainage studies on NHS roadways.

* WASA has primary responsibility and DDOT conducts drainage studies as part of roadway reconstruction projects, only.

Program Area: Public Rights of Way, Storm Sewers and Catch Basins (cont.)

Function	Agency Responsibility	Comments
Cleans sidewalks, curbs, gutters, alleys and roadways.	DPW	Property owners are responsible for cleaning sidewalks, curbs and gutters in front of property. DDOT cleans some portions of the right of way.
Performs routine maintenance for sidewalks, curbs, gutters, bridge scuppers, alleys and roadways.	DDOT	DDOT S.M. will be performing crack sealing, mill/overlay and executing a preventive maintenance contract all in conjunction with the PMS.
Repair sidewalks, curbs, gutters, bridge scuppers, alleys and roadways.	DDOT	WASA repairs damage resulting from utility repair work.
Replace sidewalks, curbs, gutters, bridge scuppers, alleys and roadways.	DDOT	
Construct new sidewalks, curbs, gutters, bridge scuppers, alleys and roadways.	DDOT	
Construct drainage ditches.	DDOT	
Clean and maintain drainage ditches.	DDOT	

Program Area: Innovative Storm Water Management Practices and Financing

Function	Agency Responsibility	Comments
Design, construct and monitor/ maintain innovative storm water management facilities (including LID) on public rights-of-way.	DDOT	DDOT responsible for innovative storm water facilities in right-of-way, including roadways, alleys, medians, etc.
Design, construct and maintain innovative storm water management facilities (including LID) on WASA controlled properties.	WASA	WASA responsible for BMPs in WASA controlled public space, including catch basins, storm sewer inlets, storage facilities, storm sewers and other WASA owned properties.
Review and approve storm water BMP design plans, monitor and inspect BMPs.	DOH	DOH reviews storm water BMP design plans, comments and approves final plans.

Develop storm water standards, rules and regulations, inspect and enforce laws and regulations.	DOH	DOH is the enforcement agency for water quality issues on public and private land
Develops capital programs for design, construction and maintenance of extension of sewer lines and manholes in city streets.	WASA	WASA is responsible for the development of the capital program to improve or extend the storm sewer system, including catch basins, inlets, storm sewer connections and storm sewers Reference MOU signed in 2002, Item 4, sec. (a)-3,4; DDOT is financially responsible for extension.
Develops capital programs for design, construction and maintenance of storm water management facilities on District rights-of-way.	DDOT	DDOT is responsible for the development of capital programs to improve storm water facilities constructed as part of the roadway right-of-way.

Program Area: Construction Management Activities

Function	Agency Responsibility	Comments
Allocates capital resources to design and construct storm water pollution control facilities as part of roadway and alley reconstruction.	DDOT	
Prepares design plans and specifications for storm water pollution control facilities as part of roadway, alley reconstruction, including erosion control plans at work sites.	DDOT	
Submits design plans and specifications and erosion control plans at work sites to DOH for review and approval.	DDOT	Submit to DOH approval before the construction contract is executed
Coordinates design plans and specifications with WASA.	DDOT	Solicit comments from WASA before the design contract is finalized
Reviews, provides comments and provides final approval of	DOH	There is a need here, to address to permit fees, charges.

storm water pollution control facilities constructed by DDOT in the public right-of-way and erosion control plans for transportation facility construction sites.		
Constructs and maintains storm water pollution control facilities constructed by DDOT in the public right-of-way.	DDOT	Street cleaning responsibilities belong to DPW. Below surface maintenance responsibilities belong to WASA.

Program Area: Construction Management Activities (cont.)

Maintains erosion control facilities at construction sites, consistent with the approved plans.	**DDOT**	Enforcement is done by DOH by - way - of, ticketing the contractor.

Program Area: Pumping Stations and other Storm Water Facilities

Function	Agency Responsibility	Comments
Maintains inventory of pumping stations.	WASA	
Inspects pumping stations.	WASA	
Develops capital program to repair and replace pumping stations.	WASA	
Cleans and maintains pumping stations.	WASA	

Program Area: Snow Management and Deicing Activities

Function	Agency Responsibility	Comments
Develop Snow Management Plan that limits pollution to District waterways.	DDOT	Develops and maintains a snow management/operations plan to restore transportation services as soon as possible after a snow event and minimize the impact of such practices on the environment.
Obtains manpower, equipment and supplies to manage snow operations, including deicing	DDOT	DDOT will determine the types of supplies and equipment to be utilized for each snow event, depending upon weather forecasts

supplies and equipment.		and actual conditions.
Makes management decisions on allocation of resources for each snow even.	DDOT	DDOT will determine the types of supplies and equipment to be utilized for each snow event, depending upon weather forecasts and actual conditions.
Under declaration of a snow emergency, dumps snow on upland locations.	DDOT	Upon the designation of the Mayor, DDOT may dump snow on upland locations.